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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,472	02/11/2004	Daniel James Branagan	NANO004U	4067

32047 7590 01/12/2011

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EXAMINER	
ZHENG, LOIS L	
ART UNIT	PAPER NUMBER
1733	

MAIL DATE	DELIVERY MODE
01/12/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/776,472	BRANAGAN, DANIEL JAMES	
	Examiner	Art Unit	
	LOIS ZHENG	1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 November 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 12* is/are pending in the application.

4a) Of the above claim(s) *1-5* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6,7 and 12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

1. Claims 6 and 12 are amended in view of applicant's response filed 8 November 2010. Claims 8-11 and 13-16 are canceled. Claims 1-5 remain withdrawn from consideration. Therefore, claims 6-7 and 12 are currently under examination.

Status of Previous Rejection/Objection

2. The objection of claims 12-14 are withdrawn in view of the amendment of claim 12 and the cancellation of claims 13-14 in applicant's response filed 8 November 2010.

Claim Interpretation

3. Regarding claim 6, since no specific order is required for executing processing steps, the examiner is interpreting that the sequence of the claimed processing steps can take place in any order. In addition, since processing steps recite the same iron based metallic coating alloy and the metal surface is relatively clean(i.e. the cleaned surface may still contain oxides) with the application of the iron based metallic coating alloy, the examiner is interpreting that the claimed processing step of applying the liquid metal of the iron based alloy to an oxidized metal surface to provide a clean metal surface and the claimed processing step of applying an iron based metallic coating alloy to the clean metal surface may take place simultaneously(i.e. these two processing steps are the same coating application step) based on the broadest reasonable interpretation.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 6-7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dorfman US 4,822,415(Dorfman), and further in view of Kim et al. US 5,643,531 (Kim).

Dorfman teaches thermal spraying processing using an iron based alloy powder to produce a protective coating(abstract, col. 1 lines 6-9). Dorfman's iron based alloy composition comprises Cr, B and C(abstract, col. 2 line 66 – col. 3 line 65). Dorfman further teaches that preferably less than 15% manganese can be included in the iron based alloy to improve corrosion resistance and ductility, preferably Zr, Nb, Ti, Va, Hf in a total amount of less than 10% can be added to further improve wear and corrosion resistance, and preferably phosphorous in an amount of less than 1% can be added to reducing melting point(col. 4 lines 6-18). The iron based alloy powder as taught by Dorfman can be produced by standard method such as atomization and the thermal spray process using the iron based alloy powder produces a coating that is substantially or entirely amorphous(col. 4 lines 53-63). Dorfman further teaches that the thermal spraying process is a plasma spraying process(col. 1 lines 24-39). Dorfman does not teach using a bond coat.

Regarding claim 6, the thermal spraying process as taught by Dorfman includes the claimed step of providing an atomized iron based metallic coating alloy comprising the claimed deoxidizing elements including manganese, a metal selected from Cr, Va, Ti, Zr, Hf, Nb and combination thereof and an oxygen seeking nonmetal/metalloid including boron. The thermal spraying process as taught by Dorfman also melts the iron based coating alloy as claimed and applies the iron based coating alloy to a metal surface to provide a coating layer(col. 4 lines 56-59). The claimed removing of oxidized metal surface layer having a native oxide layer to provide a relatively clean metal surface is expected in the coating application process of Dorfman. Additionally, one of ordinary skill in the art would have expected that the coating formed by the process of Dorfman to contain at least a fraction of metallic glass as claimed since Dorfman teaches that its coating is substantially or entirely amorphous.

However, Dorfman does not explicitly teach that the thermal spraying process is a process of metallic coating by claimed high velocity oxy-fuel spraying technique.

Kim teaches applying a ferrous alloy coating to a metal substrate of similar composition, wherein the ferrous coating alloy comprises 18-42wt% Cr, 1.0-3.2 wt% Mn, 3.0-4.5wt% B, 1.0-3.0 wt% Si, less than 0.3wt% C and less than 0.5wt% of P (abstract, col. 2 lines 53-63). Kim further teaches that the ferrous coating alloy is made into powder and can be applied by various thermal spraying techniques such as HVOF(i.e. high velocity oxyfuel), plasma, etc. depending on the shape to be sprayed.(col. 3 lines 31-40). The coating produced is amorphous(col. 2 line 13).

Therefore, it would have been within the skill of one of ordinary skill in the art to have chosen various thermal spraying techniques in the thermal spraying process of Dorfman, including HVOF, depending upon the shape to be sprayed in order to achieve expected success of producing an amorphous metallic coating as taught by Kim.

In addition, the claimed function as a doxidizing element flows naturally from the teachings of Dorfman in view of Kim since the iron based metal alloy as taught by Dorfman in view of Kim comprises manganese, which would have been capable of removing the native oxide layer from the metal surface as claimed. Furthermore, the total amount of manganese in the iron based metal alloy as taught by Dorfman in view of Kim overlaps the claimed deoxidizing element amount of 5-70%. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05.

Furthermore, since Dorfman in view of Kim is silent with respect to precipitation of manganese from the alloy, one of ordinary skill in the art would have expected no precipitates from the deoxidizing element to occur. Additionally, since Dorfman in view of Kim teach a coating process that is substantially the same as claimed coating process, one of ordinary skill in the art would have expected that the manganese in the iron based coating alloy of Dorfman in view of Kim would have remained dissolved in the alloy melt as claimed, which would have retained an affinity for oxygen as claimed.

Furthermore, regarding the claimed coating thickness of 40-110mil, Example 1 of Dorfman produces a coating thickness of up to 1.3 mm(i.e. up to 51.181 mil)(col. 5 lines 59-61), which overlap the claimed coating thickness. In addition, the desired coating thickness depends on the desired level of protection which varies for different

applications. Coating thickness is also determined or affected by the length of coating time. In other words, the longer the metal surface is sprayed with the coating composition, the thicker the coating becomes. Therefore, it would have been obvious to one of ordinary skill in the art to have varied the coating time via routine optimization in order to achieve desired coating thickness for desired level of protection for the metal substrate.

Furthermore, the examiner takes a position that the claimed ASTM C633 bond strength is an inherent property of the metallic coating layer. Since Dorfman in view of Kim teach a coating process that is substantially the same as the claimed coating process using an iron based alloy that is substantially the same as the claimed iron based coating alloy, the coating layer formed by the process of Dorfman in view of Kim would also have an ASTM C633 bond strength that is substantially the same as the claimed and is also present in the claimed coating thickness. In other words, one of ordinary skill in the art would have found the claimed ASTM C633 bond strength of at least 12,000psi obvious in a coating thickness from 40-110mil formed by the coating process of Dorfman in view of Kim because Dofman in view of Kim use the substantially the same metallic coating as claimed in a substantially the same coating process as claimed.

Lastly, Dorfman further teaches that its iron based coating alloy is characterized by a combination of improved properties such as corrosion resistance, frictional wear resistance and abrasive wear resistance(col. 2 lines 53-57). Dorfman in view of Kim is also silent with respect to the claimed coating failure at a coating/metal surface

interface. Therefore, one of ordinary skill in the art would not have expected the claimed coating failure to occur in the coating produced by the process of Dorfmann in view of Kim absent persuasive evidence that the coating produced by the process of Dorfmann in view of Kim would fail at the coating/metal surface interface.

Regarding claim 7, Dorfman further teaches that iron based alloys with lower boron content exists in amorphous form if produced by quenching(col. 4 lines 26-30). Therefore, the examiner concludes that the process of Dorfman in view of Kim does not produce precipitate when the iron based alloy is melted.

Regarding claim 12, Dorfman further teaches the claimed oxygen seeking non-metal/metalloid such as carbon and phosphorous.

Response to Arguments

6. Applicant's arguments filed 8 November 2010 have been fully considered but they are not persuasive.

In the remarks, applicant argues that Table I of the present application demonstrate superior bond strength in coating produced by the HVOF spraying technique of the instant invention over the coating produced by wire arc thermal spraying technique. Therefore, Dorfman's thermal spraying process would not have produced a coating with claimed bond strength.

The examiner does not find applicant's argument convincing because Dorfman's plasma spraying technique and the wire arc thermal spraying technique used in comparison to HVOF spraying technique as shown in Table I of the present application are different spraying techniques. Additionally, the lack of teaching of a HVOF spraying

technique by Dorfman is remedied by teaching of the secondary reference Kim, which teaches the claimed HVOF spraying technique. See paragraph 5 set forth above.

Applicant further argues that Kim teaches pre-treating the metal alloy to remove native oxide layer, which is not required by the instant invention.

The examiner does not find applicant's argument convincing because Kim is not the primary reference in the rejection ground. Kim is incorporated into the teachings of the primary reference Dorfman to show that using HVOF spraying technique is prima facie obvious. See paragraph 5 set forth above. Therefore, the teaching of pre-treating the alloy surface as taught by Kim is not part of the rejection.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Surface Hardening of Steels, page 8, Table 4, shows that HVOF coating process produces a ferrous coating with higher bond strength than plasma spraying process.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LOIS ZHENG whose telephone number is (571)272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ Roy King/
Supervisory Patent Examiner, Art Unit 1733

LLZ